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NAVAL HANDBOOK

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FOR
NATIONAL DEFENSE
AND FOR
THE EUROPEAN WAR

★

COMMANDER T. D. PARKER

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Benjamin Ide Wheeler

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Lucretia Kent Foundation

THE UNITED STATES FLAGSHIP WYOMING

NAVAL HANDBOOK

AS BEARING ON

NATIONAL DEFENSE AND THE EUROPEAN WAR

BY

THOMAS DRAYTON PARKER

COMMANDER, U. S. NAVY (RETIRED)

AUTHOR OF

YOUNG HEROES OF THE AMERICAN NAVY

ETC.

SAN FRANCISCO

JOHN J. NEWBEGIN

1916

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PREFACE

WHAT THIS HANDBOOK IS.—*Every civilian who trains his glasses on the Channel, the Baltic, or the Dardanelles, finds his view blocked by a series of questions that interpose like hands across the lens of a telescope. "How far can a big gun shoot?"; "What is a battle cruiser?"; "Can an aeroplane sink a battleship?"; "Why don't they scrap their dreadnoughts?"—and so on. True, our citizen could dig out his information from text-books, or run through the files of newspapers and technical magazines: but life is too short; he wants an answer at once, and for want of it is tripped up by a few facts, the ABC's of another profession, that could be readily given off hand. He goes wrong on the earlier sea fights of the war because he fails to discriminate between battleships and cruisers; he finds submarine warfare dark and deep because, for all he knows, the U-29 and K-6 may have cage masts and turrets; he cannot say what neutrality is, since he lacks the elements of International Law, and he is hurled to the ground in aerial talk because his Parsevals are seaplanes, or his Zeppelins, Taubes.*

We sincerely wish to help this man—to change him, during one short half hour, into a wizard who will astonish his sons and command respectful attention from Old Boys at the club. At least we can give him, by explaining away some trifling difficulties, a far better understanding of the situation in Europe.

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WHAT THIS BOOK IS NOT.—*This is not a scientific or technical treatise. It has no professional significance. It is for the man on the street; avoids the esoteric or abstruse; and, while based on established naval thought, lays no claim to originality.*

The questions answered are being asked daily by intelligent, even eminent men, whose work has lain along other than naval lines. The answers are based on ideas absorbed during two decades of naval service. The explanations are correlated with admitted events of the war, to which frequent allusions are made.

It may be unnecessary to add that the Handbook is strictly non-partisan, and is written from the standpoint of a discreet neutral. Matters of general naval knowledge have been selected as bearing on the war; known past events are touched on; and the reader is left to form his own opinions. The Handbook, though for the European war, does not attempt to pass judgments, argue, or predict.

As bearing on the question of national defense, facts as to our own naval strength are emphasized: but here again the "Gentle Reader" must draw his own conclusions.

CONTENTS

		PAGE
A Hundred Questions Asked and Answered		VII, VIII, IX
CHAPTER I.	Types of Warships and their Functions	1
CHAPTER II.	The Dreadnought—"The Mechanical Whale"	7
CHAPTER III.	The Cruiser—"The Eyes of the Fleet"	16
CHAPTER IV.	The Submarine—"The Mechanical Swordfish"	23
CHAPTER V.	Other Classes—Including the Train	32
CHAPTER VI.	Guns and Ammunition	38
CHAPTER VII.	Torpedoes and Mines	45
CHAPTER VIII.	Some Principles of Naval Warefare	52
CHAPTER IX.	Some Points in International Law	64
CHAPTER X.	Ships of the Air	71
Appendix	Strength of Our Own and of Foreign Navies	76
Index		77-79

LIST OF ILLUSTRATIONS

	PAGE
United States Flagship Wyoming	*Frontispiece*
The British Battle Cruiser Lion	19
The German Submarine U-36	25
A Submarine Awash	29
Diagrams	52, 59, 60

"To be prepared for war is one of the most effectual ways of preserving peace."—GEORGE WASHINGTON.

"Nothing is more terrible than active ignorance."—GOETHE.

A HUNDRED QUESTIONS ASKED AND ANSWERED

(See also Index in back)

NOTE.—These questions (answered with others in the Handbook) are arranged in alphabetical order of "Key" words. In searching for a question and its reference, look in the list of key words for the significant word of the question. References are to pages giving the answer.

For instance: Question—"What is the Freedom of the Sea?" Look in the list of key words for "Freedom" and opposite this find "69," denoting the page.

QUESTION	KEY WORD	REFERENCE (PAGE)
1. Do Aeroplanes Attack Ships?	Aeroplanes	73
2. Can an Aeroplane Find a Submarine?	"	26
3. How Many Aeroplanes Have We?	"	75
4. How do Submarine Crews Get Air?	Air	29
5. How Thick is a Dreadnought's Armor?	Armor	39
6. What are Auxiliaries?	Auxiliaries	6, 35
7. What is an Advanced Base?	Base	58
8. What is a Battleship?	Battleship	1, 2
9. What is the Speed of a Battleship?	"	13
10. What is the Cost of a Battleship?	"	14
11. What are the Laws of Blockade?	Blockade	67
12. Is Aerial Bomb Dropping Effective?	Bomb	73-4
13. Is it Legal to Bombard Unfortified Towns?	Bombard	69
14. What is meant by "Capping" the Enemy?	Capping	61
15. What is the Cost of a 42-Centimeter Charge?	Charge	43
16. Is it Permissible to use False Colors?	Colors	68
17. What is Command of the Sea?	Command	8, 56
18. What is Contraband of War?	Contraband	65
19. What is "Fire Control"?	Control	12
20. What is a Convoy?	Convoy	18
21. What is a Battle Cruiser?	Cruiser	4, 17
22. What is an Armored Cruiser?	"	4, 18
23. What is a Protected Cruiser?	"	5, 20
24. How Many Battle Cruisers Have We?	"	3
25. What are Light Armored Cruisers for?	"	5, 18
26. What is a Destroyer?	Destroyers	5
27. Do Destroyers Attack by Day?	"	32
28. When and How do Destroyers Attack?	"	6, 32
29. What is the Speed of a Destroyer?	"	34
30. What is the Cost of a Destroyer?	"	34

QUESTION	KEY WORD	REFERENCE (PAGE)
31. Are we Strong in Destroyers?	Destroyers	34
32. Are Dreadnoughts Obsolete?	Dreadnoughts (See also Battleships)	7
33. What have Dreadnoughts Done in the War?	"	9
34. What are the Characteristics of a Dreadnought?—size, speed, etc.	"	12
35. What is the Cost of a Dreadnought?	"	14
36. Are we Strong in Dreadnoughts?	"	*Appendix*
37. What is "The Freedom of the Sea"?	Freedom	69
38. What is a Time Fuse?	Fuse	43
39. What is a Percussion Fuse?	"	43
40. What Guns do Dreadnoughts Carry?	Guns	40
41. What Guns do Battle Cruisers Carry?	"	41
42. What Guns do Destroyers Carry?	"	10, 12, 42
43. Do Submarines Carry Guns?	"	29
44. How Far Can a Big Gun Shoot?	"	39
45. What is a Gunboat?	Gunboat	5
46. What is a Hangar Ship?	Hangar	36
47. What are Inside Lines?	Inside	53
48. What is Meant by "Interned"?	Interned	21
49. What is a Floating Mine?	Mines	49
50. What is a Contact Mine?	"	49
51. What is an Observation Mine?	"	48-9
52. How are Mines Exploded?	"	49
53. What Explosive Charge Has a Mine?	"	50
54. What Happens When a Mine Explodes?	"	50
55. What is the Law about Mines?	"	68
56. Is it Legal to Sell Munitions of War?	Munitions	65
57. What is a Periscope?	Periscope	28
58. Is it Legal to Change a Ship's Registry After War Begins?	Registry	69
59. What is a Scout Cruiser?	Scout	5
60. What is Screening?	Screening	20
61. What is a Seaplane?	Seaplane	72
62. What is the Weight of a 14-inch Shell?	Shells	42
63. What is the Weight of the Largest Naval Shells?	"	42
64. Is it Legal to "Starve Out a Nation"?	Starve	67
65. Has the Submarine Been Successful?	Submarine	8, 24
66. How are Ships Protected from Submarines?	"	15, 26

QUESTION	KEY WORD	REFERENCE (PAGE)
67. Can Submarines Give Command of the Sea?	Submarine	8, 24
68. Do Submarines Fight Submarines?	"	23
69. How are Submarines Sunk or Captured?	"	26
70. What have Submarines Done in this War?	"	24
71. What are the Characteristics of a Submarine—speed, range, etc.?	"	26
72. What is the Cost of a Submarine?	"	27
73. What Motive Power do Submarines Have?	"	27
74. What are the Fittings of a Submarine?	"	27
75. How are Submarines Operated (submerged, etc.)?	"	27
76. How do Ships Escape from Submarines?	"	29
77. Have many Submarines been Sunk in the War?		26
78. What is the Three-Mile Limit?	Three	68
79. How Far and Fast Can a Torpedo Travel?	Torpedo	45
80. What is "Torpedo Defense"?	"	2
81. What Charge is Carried by a Torpedo?	"	46
82. How is a Torpedo Propelled?	"	46
83. How is a Torpedo Steered?	"	47
84. How is a Torpedo "Fired"?	"	46
85. Do Battleships Carry Torpedoes?	"	45
86. What is the Cost of a Torpedo?	"	45
87. What is the Train?	Train	6, 35
88. What is a Transport?	Transports	35
89. Are Transports Armored and Armed?	"	36
90. What is a Trawler?	Trawler	35
91. Is it Lawful to Sink Ships Without "Visit and Search"?	Visit	66
92. Should Neutral Merchantmen Permit "Visit and Search"?	"	66
93. Can Torpedoes be Steered bv Wireless?	Wireless (Radio)	48
94. What is a Wireless Chain?	"	20
95. What are the Characteristics of a Zeppelin—size, range, etc.?	Zeppelins	72
96. Is the Zeppelin a Failure?	"	73
97. How are Zeppelins Armed?	"	72
98. Do Aeroplanes Attack Zeppelins?	"	74
99. Have we any Zeppelins (dirigibles)?	"	75
100. When do Zeppelins Attack?	"	74

CHAPTER I

TYPES OF WARSHIPS AND THEIR FUNCTIONS

SCIENTISTS tell us to begin no discussion until our definitions are straight. To understand current accounts of the great war we must discriminate among classes of warships and understand their normal uses. In this chapter the types are explained; in later chapters, the more important are separately considered. The man on the street, too busy to be exact, calls every warship, from a super-dreadnought to a submarine, a "battleship," just as he calls every type of air machine an "airship," and every young officer he meets "lieutenant."

Any naval classification should include: dreadnoughts, battleships, monitors, battle cruisers, armored cruisers, protected cruisers, gunboats, scouts, torpedo boat destroyers, torpedo boats, submarines; and special classes, such as mine-layers, trawlers, hospital ships, and transports. These special classes may be included in the word Train.

DREADNOUGHTS (SUPER-DREADNOUGHTS), BATTLESHIPS.—The term *battleships*, in a general sense, includes all heavy fighters designed for the battle line —*not* the little fellows, as many people think. In the broader sense it includes the dreadnought; though in a narrower sense we call the largest ships of this type, dreadnoughts (or super-dreadnoughts), and the old-

er, smaller ones, battleships. In our navy the South Carolina and the Michigan (of about 16000 tons) may be classed either as the last of our "battleships," or (with reference to their guns), the first of our "dreadnoughts." All later ships (to about 32,000 tons) are *dreadnoughts*, and of these the largest, beginning with the huge Pennsylvania, are often called *super-dreadnoughts*. In the official Navy Register these terms are not used, but the "all-big-gun" ships, beginning with the South Carolina, are listed as "Battleships—First Line," while the earlier ones are called "Battleships—Second Line."

The dreadnought is named after the first British ship of the kind, which suddenly appeared to startle the Germans and others. In the main battery, unlike the older ships, it has only one size of gun (12-inch to 15-inch). It has also a *secondary battery* (4-inch to 6-inch) for short-range "torpedo defense"—that is, for repelling attack by torpedo boats. The older type of battleship, now rapidly becoming extinct, will after a few years seldom venture beyond its habitat, the back basins and upper reaches of navy yards; but the British found it useful in the Dardanelles, where they could lose a Majestic more cheerfully than a Queen Elizabeth. In general, battleships aged twenty years or more are considered ready for the bone-yard. Except for the Audacious, the battleships lost by the British have so far been in, or near this class. The Germans have kept their battleships at home, but may have lost one.

The function of the battleships is *straight*, *hard*

fighting. They constitute the real navy. Friendly cruisers, repair ships, scouts, and so on, exist chiefly to help them; enemy destroyers and submarines, chiefly to harm them—though in this war, for want of better prey, German submarines are attacking merchantmen. The naval war game centers about the big ship.

THE MONITOR, named, of course, after Ericsson's cheese box, is a special class of battleship developed in America. Being half submarine, it has *the water* for armor. With only a few feet of freeboard, all its cabins, bathtubs, pianolas, etc., can be shot away without destroying its military value. The armored turrets will remain, and the engines below the water line. Still, it is slow, hot, and unwieldy, carries few guns, and, as a type, is becoming obsolete. It was thought to be superb for harbor defense, but forts make the best local defenses, and ships defend their harbors several hundred miles at sea. Monitors were used by the British ~~in the fighting off Flanders.~~

CRUISERS are in three important classes: The *battle cruiser* (as yet we have none), combining the speed of the cruiser with the armor and guns of the battleship; the *armored cruiser* (an obsolete type in which we are strong), carrying less armor and fewer guns; the *protected cruiser*, which has no side armor, but has an armored deck (a curved ~~deck of steel~~ plate under one of the ordinary decks) to protect the machinery and other vitals.

THE BATTLE CRUISER can take its place in the line of battle; for it is heavily armored, and carries big guns, though not so many as the dreadnought. It can overtake almost any ship of the enemy; for its speed is 28 to 30 knots and upwards, against 20 to 25 of the dreadnought. It is more powerful than an older battleship, and is valuable for raids, attacks on strong convoy escorts, and other operations resembling those of cavalry in the army. It is a type we are badly in need of, but have felt unable to pay for! The running North Sea fight (following a raid on the English coast), in which the German cruiser Blücher sank, was a fight between battle-cruiser squadrons. The Blücher was lost because of her relatively slow speed, which caused her to lag behind, so that the pursuing British ships could concentrate their fire on her.

THE ARMORED CRUISER (our Maryland class, on the West Coast) is now too weak for the battle line, and too slow to escape from battle cruisers or fast battleships. It may be useful for convoying other ships, for attacking convoys, for supporting scouts and destroyers, or for running down merchantmen. Our armored cruisers have turrets, but no guns larger than 8-inch or 10-inch. Their contract speed is about 22 knots.

In appearance battle cruisers, and even armored cruisers, resemble battleships, but armored cruisers are long and narrow. Our ships of the Maryland class have one cage mast and two turrets.

THE PROTECTED CRUISER (our Milwaukee or Charleston) is smaller than the armored cruiser, and seldom carries guns larger than about 6-inches (diameter of bore). Its function is to destroy the enemy's commerce, form wireless chains, screen the fleet, perhaps, and (in the absence of scouts) find the enemy.

THE GUNBOAT and the small unprotected cruiser are about the same, except that the term gunboat applies to the smaller vessels of this type (say of 2000 tons, or less). They are "handy-billys," and have miscellaneous uses—commerce destroying, patrolling, blockading, and so forth. Our gunboats have been used for restoring order in turbulent Caribbean and Central American ports.

The cruiser has developed in various combinations with other types. We have spoken of the battle cruiser, a centipede with plenty of sting and many legs; the British have a light armored cruiser to prey on destroyers; and other types have been tried or suggested.

THE SCOUT is unarmored, lightly armed, and (being very fast) trusts chiefly to its heels. Its function is to discover the enemy—and keep out of danger. We have only three scouts (Birmingham class), and must do our scouting with cruisers and destroyers.

THE TORPEDO BOAT DESTROYER, originally designed to destroy torpedo boats, is merely a large

torpedo boat, and now preys chiefly on *battleships* and *submarines*. It is expected to make night surprise attacks, or to launch torpedoes at battleships under fire during action. It accompanies the fleet in expeditions overseas.

The TORPEDO BOAT is used chiefly to defend home waters or bases for the fleet; it may also issue from protected harbors to surprise enemy ships.

THE SUBMARINE we all know—in a general way. The largest divers now building can make long sea voyages—from the North Sea to the Dardanelles, or across the Atlantic and back. Fighting chiefly with the torpedo, they can also mount rapid-fire guns, and to the offensive power of the torpedo boat add that other quality, submersibility.

THE TRAIN includes all the unarmed or lightly armed ships, with special duties, that accompany or serve the fleet—hospital ships, distilling ships, repair ships, supply ships, mine layers, trawlers, fuel ships (colliers and oil ships), and transports. We are weak in all these special classes. In time of war, merchant ships may be given a coat of war paint and transformed into naval auxiliaries; but we are also weak in merchant ships, and our scanty merchant marine must provide for the army also. When the actual fighting is on, the chief object of the unprotected train is *to keep out of the way*. On long expeditions it goes with the fleet.

CHAPTER II.

THE DREADNOUGHT—"THE MECHANICAL WHALE"

IS *the dreadnought obsolete?* Some months before the war, Sir Percy Scott, a noted English authority, astonished the world by advising Great Britain to build no more dreadnoughts. Prophesying that the submarine and the airship would drive the battleship from the seas, he said it was folly to invest vast sums in big craft, when the fate of every dreadnought might be sealed in the torpedo of some tiny submarine, guided to its prey by an overhead scout.

To the lay mind his prediction has been verified. So far, during this war, we have heard much of bolts from blue sky and blue sea, little of thundering armorclads. We must distinguish, however, between active and potential forces, between seen and unseen influences in war. A closer look indicates that, whatever the future may hold in store, the dreadnought power is still decisive at sea, and that submarines exist because *dreadnoughts must be destroyed.* In the present state of submarine development, a nation building "divers" alone might be strong in defense proper, but lamentably weak in that strongest defense, the distant offensive. She could parry, she could counter, but she could not lead. Of course, the future may have in store *submersible battleships*, in

which case the diver quality will undoubtedly add great offensive as well as defensive power; but looking some distance ahead, and disregarding rumored exceptions, we must realize that the distant offensive, or the aggressive power, of the submarine is still limited. To some extent it can hamper (without preventing) an enemy's commerce; it can restrain the enemy's battleships from a close blockade of ports; but it cannot prevent their ensuring (if superior) the command of the sea. While England's cruisers have swept the ocean, Germany's submarines do not stop British trade between Hong Kong and Australia, or sink their transports crossing the Channel. In fact, it appears that a large number of *submarines* have been sunk. The relation between dreadnoughts and their hidden enemies will be touched on further under the head of submarines.

What is the command of the sea? It is highly important, especially in the present war, to have a clear understanding of this term.

The "command of the sea" means having such a supremacy afloat as to make it very dangerous for enemy ships to venture out. It may refer to the ocean in general, or to a particular theatre of operations. In this war, but for the submarine, Great Britain's command would be absolute—her own ships could ply at will, and it would be fatal for any enemy ship, merchantman, or warship, to venture upon the high seas, except by way of "stealing a base." But the submarine can slip through a cordon of battleships, and can make it dangerous for British warships

or merchantmen in the open; so that, while British guns have stopped German commerce, and British merchantmen still venture where they please (with a percentage of losses), we cannot say that either side has absolute command.

History shows that this command has been decisive in many wars. In our own Civil War it enabled the Union forces to starve out the Confederacy; in the great Napoleonic wars it prevented Napoleon's eagerly desired invasion of England, and resulted in his ultimate downfall. "Only give me," he said, "the command of the Channel for twenty-four hours!"—but that, thanks to Nelson and other salts, he never got.

What have dreadnoughts accomplished in this war? Through a crushing superiority in big ships, the stronger dreadnought force has kept the other bottled up in protected harbors. The weaker force has so far been able to accomplish little or nothing. Let the United States take notice! The lesson for us is obvious. Thanks to friendly dreadnoughts in reserve, allied cruisers were able to sweep the ocean with no fear of molestation. Without battleships to "contain" (or hold back) enemy battleships, these commerce destroyers would have been caught in turn. As it is, the submarine, with all its startling activities, has not been able to keep its flag waving on merchantmen at sea. Prevented by dreadnoughts from sending troops and supplies to aid her colonies, Germany has lost all but two. Though submarines have, as yet, stopped only a small percentage of the vast

fleet supplying England with foodstuffs, battleships have threatened Germany's entire food supply. Spared invasion, England has thrown a million men across the Channel, and drawn munitions of war at pleasure from neutral countries. No one questions that, with existing conditions, the work of the dreadnought fleet "in being," if not "in action," is vitally important. All newspaper reports indicate that, with the story of the war unrolling before them, our best naval authorities are calling, "more triple turrets—more big guns!"

Though most of the naval fighting *as yet* has been between cruisers and smaller craft, we may note several cases in which the allied battleships have been useful. If second-line ships have been used, it is merely because the others are needed to watch the German fleet, and are too valuable to be risked. In the Dardanelles the Allies have used battleships to hammer forts and to cover the landing of troops. During the fighting in Flanders, and later off the Baltic coast of Russia, they used big ships to pound the enemy ashore.

With their 12-inch, 14-inch, even 15-inch guns, dreadnoughts make very convenient mobile forts, and can often protect troops ashore against even larger bodies. During our occupation of Vera Cruz with a "handful of men," when large bodies of Mexican soldiery were reported a few miles away, we felt no special uneasiness, knowing that if necessary the big guns of our fleet could batter back advancing forces.

In the Baltic, where the British cannot pierce and

the Russians are securely "canned," German battleships were used to bombard Windau, Riga and other ports—but our information is meager.

Of the British casualties, the greatest—the reported loss of the dreadnought Audacious at Lough Swilly, one of their naval bases—has already been referred to. The Germans assert also that the large battleship Superb (19,000 tons) was lost in a mysterious battle off Bergen (the British Admiralty denies this). The sinking of the Agamemnon (16,750 tons) in the Dardanelles was also reported and denied, but there seems to be no question of the loss from submarines or mines of the older battleships—Irresistible, Ocean, Goliath, Triumph and Majestic—in the effort to push through to Constantinople. The Bulwark sank mysteriously at Sheerness, and the Formidable went down near a porpoising submarine in the Channel. The losses of officers and men have been heavy, probably in excess of 12,000. In addition the French have lost the Courbet, torpedoed in the Strait of Otranto, and the Bouvet and Gaulois sunk in the Dardanelles. Heavy toll all this, and much to the credit of the submarine; but we must always remember that aggressive war cannot be waged without risks. The percentage of losses would indicate a doubt as to putting too many turrets on one ship. Against an enemy strong in submarines, two small battleships may be better than one dreadnought.

So long as one fleet is greatly superior in dreadnoughts, the other must remain in harbors protected

by pickets, mines, boom and net defenses (see under Torpedo Nets, page 33), cables, and forts. Unless submarines or airships sink enough enemy battleships to make the opposing numbers approximately equal, a weaker force will remain under cover. If the disproportion ceases, the two fleets will, sooner or later, meet and fight for the command of the sea—as the Russian and Japanese fleets fought in the Sea of Japan. One fleet may try to intercept the other, or to catch parts before a junction in order to destroy them separately. In these prior operations the hunter will send out scouts, aeroplanes, airships, to find the hunted, who will cruise with his main body strongly "screened" by advance and flanking lines of scouts, destroyers, armored cruisers. When the actual battle comes, the hard decisive fighting will be between the two lines of battleships. During the action, destroyers, submarines and aircraft may attack dreadnoughts under fire; for the main object of each side will be the destruction of the enemy's big ships.

What are the characteristics of the dreadnought? Beginning with its guns: In the old days the battleship had four or five different calibers, making it necessary to carry four or five different kinds of ammunition, with attendant difficulties in controlling the fire of various classes of guns (the term "Fire Control" refers not to the handling of guns, but to the directing of the fire—the estimating and correcting of ranges so as to place shots on the target). *Dreadnoughts* have only three calibers—big guns for heavy fighting, smaller guns for "torpedo defense," and of

late still smaller *aerial guns*. These big guns range in size from 11 to 15 inches (the Germans have, until recently, preferred 12-inch guns; our largest are now 14-inch; the British have 15-inch), and are mounted in turrets, either two or three to a turret (the French are building four-gun turrets). There may be two turrets forward and from two to four aft.

Dreadnoughts also have submerged torpedo tubes for discharging torpedoes below the water line. Our California, for instance, will have four 21-inch tubes.

ARMOR.—Dreadnoughts and battle cruisers are heavily armored. Armored cruisers and monitors carry some side armor and have armored turrets. The side armor of the California will be 14 inches thick, and her turrets will have 18 inches.

SPEED.—The speed of battleships is gradually increasing, though this, for a given size, means decrease of either armor or armament. But, so far, *size* has been constantly increasing, so that armor, armament and speed have advanced together. A modern dreadnought of 32,000 tons would make from 20 to 25 knots, and might carry ten 14-inch guns, with 14 inches of side armor. Our earlier battleships of, say 12,000 tons, make only about 16 knots, with four 12-inch guns and 12 inches of side armor. Our fastest dreadnoughts now in commission make about 21 knots; the California will also make 21. But a size limit will be reached when the draught of ships approaches that of important harbors, and their beam

the width of the locks of the Panama Canal. Danger from submarines may also have a bearish influence—"too many eggs in one basket!" may be the cry. Then armor, armament and speed will fight to a finish, each clamoring for "a place in the sun." In the writer's humble opinion, *armor* will have to yield.

The California will be our first battleship with an *electric drive.*

Though battleships were once relatively slow, the modern dreadnought can run down anything except a fast destroyer, scout, or battle cruiser. The study of tactics indicates that the superior speed may be of great importance in fighting—the faster fleet has the choice of fighting or of running away, and can choose the battle range at which its own guns are most effective.

The cost of a modern dreadnought (including armor and armament) is $15,000,000, or more.

How are battleships distinguished? Battleships, battle cruisers, armored cruisers and low-lying monitors are the only ships that have *turrets.* The first two are variations of the same type, and indistinguishable from a distance; armored cruisers are narrower, smaller, and have smaller and fewer turrets.

In our navy, battleships and armored cruisers are distinguishable by their *cage masts.* No other nation, except Argentina (whose two fine dreadnoughts were built in America), have these elongated bird-cages, with their "spotting tops," fitted with instruments used by "spotters" in marking the fall of shots.

How are dreadnoughts protected from submarines? In ending this discussion of the dreadnought, we may say that, while the supremacy of the big ship is threatened by the submarine, as it was by the submarine mine (fixed torpedo), and the torpedo boat, and will be by the aeroplane and airship, inventive minds are already evolving plans for its protection. By the time the submarine is perfected, battleship protection may be equally complete. No doubt when Farragut saw the Tecumseh blown up by a Confederate torpedo, he had visions of a whole fleet being blown to pieces; but his words were: "D—n the torpedoes!"—and his action in going ahead has been justified by the fact that, half a century later, with 10,000-yard, 40-knot torpedoes to face, the battleship still rules the seas. American and British constructors are experimenting with armor, inside and out, deep below the water line, and hope to make their ships like Achilles after his bath in the Styx. Speed is also a protection, and a screen of friendly destroyers that can ram makes it dangerous for submarines to approach. The protection of ships will be referred to further under "Submarines."

Our Naval General Board has urged a fleet of forty-eight effective battleships. Let us hope that the day is not distant when not only ship for ship, but *fleet for fleet*, we may be equal to any possible enemy.

CHAPTER III

THE CRUISER—"THE EYES OF THE FLEET"

THE fact that most of the sea fighting in the present war has been between *cruisers* has led some people to suppose that the cruiser has supplanted the battleship as a line-smashing battler. Far from it. The German victory off Coronel in the Pacific, the British victory off the Falkland Islands, and the North Sea battle in which the Blücher sank, were cruiser fights; but merely because the dreadnoughts were playing their cat-and-mouse game elsewhere. These fights would rank with cavalry skirmishes ashore, and a pitched battle between the main forces is still of the future. Ships of any class—even submarines or airships—may fight if they meet; only recently the report was that an Austrian submarine had sunk an Italian of her kind. The fact, therefore, that cruisers have met and fought must not give us a wrong impression as to their functions.

What is the function of the cruiser? The cruiser is the descendent of the old-time frigate, "the eyes of the fleet." In order to see without being caught, it must have one quality above all others—speed. Having this quality, it is well fitted for certain other duties—particularly for running down the merchant ships of an enemy. In a thoroughly modern navy, "sight seeing" is left to a special class of cruisers (see below), and a large part of the cruiser force may

be engaged in commerce destroying or the convoying of friendly commerce. This quality of speed lends itself to other uses, so that we find cruisers amalgamated with other types, making raids on enemy coast, destroying enemy torpedo craft, and even taking a place in the first line of battle.

We have already named the important types of the cruiser class—"battle," "armored," and "protected" cruisers. Some discussion of these types may throw light on current events.

In recent years the most startling development in the cruiser type is the very fast, heavily armored, big-gun bearing battle cruiser, next in offensive power to the dreadnought, and able to show it a clean pair of heels, or to overhaul anything afloat except the fastest destroyers and scouts. Battle cruisers usually have somewhat less armor than battleships and fewer big guns; but the guns are of first-line size, and the Germans, at least, have given these ships the full armor protection of dreadnoughts. Consequently, battle cruisers can take part in pitched battles for the championship of the ocean, and in this case are particularly useful to form a fast wing that can quickly take position to protect the ends of the line in case the enemy attempts a "cap" or "tee" (see explanation under "Tactics" in a later chapter), or to circle round to attack from one side while the main body is attacking from the other. They are also well fitted for raids —attacks through waters in which the enemy are stronger, where suddenness in descent and speed in escaping are necessary. The Germans have several

times used them in flying visits to the coast towns of England (after one of which they lost the lagging Blücher). In a different way, the British found the type valuable when they wished to retrieve their fallen fortunes at Coronel without delay and without detaching dreadnought units. The battle cruiser can surprise and crush the escorts of convoys (we all know, of course, that a convoy is a body of unarmed vessels protected by warships), and make fine caretakers for troopships or colliers across an ocean or an English Channel. Our strategists have been calling loudly for battle cruisers; which would serve admirably to tend troops rushed to Honolulu or Manila, or to attack invaders in either ocean; but so far all large appropriations have gone to swell our insufficient force of battleships.

Of the Armored Cruiser type we have ten—six of the Maryland class, with 6-inch and 8-inch guns; and four larger ships carrying 10-inch guns. But even 10-inch ordnance hardly has a look-in these days, and the armor of such ships is too thin for close work. No nation is now building armored cruisers. They are weaker sisters of the battle type, and have much the same uses, except line fighting, for which they have neither guns nor armor of proper kind. The British have built a light armored cruiser which can stand heavy pummeling and is able to sink other (unarmored) cruisers or *destroyers*. In the first sea battle of the war their Arethusa of this type engaged *three* German scouts near Helgoland, and decoyed them into the open sea, where battle cruisers sank them.

THE BRITISH BATTLE CRUISER LION

The Protected Cruiser, like the smaller unprotected cruiser and gunboat, is used for commerce destroying scouting, forming "wireless chains," convoy work, patrolling, blockading, etc. We have thirty-four of these various types and find them insufficient, especially as they are much needed for local "flower shows" at home, and for revolutionary work in Haiti, Central America, etc., where their function is to turn the hose on both sides and protect American citizens.

What is a wireless chain? If two naval forces are stationed a thousand or more miles apart, and wish to keep touch, it may be necessary to place between them enough vessels to establish a "wireless chain," each vessel being within wireless range of the next.

The Scout is really a special class of cruiser—all eyes and legs—its function being to find the enemy, run, and tell. To it has descended this traditional function of the cruiser type; but in our navy, with only three scouts (the Chester, Birmingham and Salem, which are too old and slow for latter-day scouting), we call freely on other cruisers for this work. At present we are badly in need of faster ships for this duty. Other nations have many scouts.

What is screening? Cruisers are also used for "screening"; that is, for blocking off enemy scouts and destroyers that try to observe or attack our main body.

It is not unlikely that at sea, as on land, airships and aeroplanes (seaplanes) will bear an important part in scouting. It seems, however, that they will not

supplant the scout, which can operate in all weathers, and can serve as "mother ship" for circling aircraft.

What is an Auxiliary Cruiser? In the present war we have heard a good deal of auxiliary cruisers. These are merchant ships, often large and fast, armed and converted into cruisers. Such ships (for instance the Mauretania) have often been designed with a view to possible use in war, and probably subsidized by their government. The Kaiser Wilhelm der Grosse, Cap Trafalgar, and other well-known German ships, fall into this class. Some of these auxiliaries have been interned—for instance, the Prinz Eitel Friedrich at Newport News.

What is internment? A ship is *interned* by a neutral government when its stay in a neutral port has exceeded the time limit under International Law. Its guns are removed, and its officers and crew are restrained from leaving the country until after the war. The object is to prevent the belligerent's using the neutral port as a haven of refuge. Internment is a bloodless victory for the enemy. The term has been improperly applied to merchant ships like the German liners tied up at New York; for International Law does not force merchantmen to run the gauntlet.

Cruisers of any class may be useful for *blockade* duty (see discussion under International Law). In the war with Spain all classes of our ships, from tugboats to battleships, were employed in the "cake walk" off Havana and other Cuban ports.

In this war, follow the battle cruiser! It is a free

lance—neither watched nor watching—free to emerge overnight for spectacular dashes, or for fights next day in mid-ocean. Its speed puts the dreadnought hull down, and baffles the submarine. Battle cruiser-dreadnoughts—a combination of the two types—are in the air.

CHAPTER IV

THE SUBMARINE—"THE MECHANICAL SWORDFISH"

THE Submarine is essentially the weapon of the weaker navy; real sea power is now reckoned in terms of dreadnoughts. Submarines can diminish the enemy's dreadnoughts (as part of a "policy of attrition"), but cannot, unaided, give command of the sea. The naval power at bay, or on the defensive, can use divers, like sharpshooters, to pick off an enemy's warships, to annoy his commerce, or to stave off invasion. But sharpshooters cannot capture fortresses; in aggressive work the submarine yields place to the big ship. For this reason the side weaker on the sea and under it can use its divers better than an enemy more powerful, more aggressive (at sea), and more exposed.

What is the relation between submarine and dreadnought? The little submarine is the implacable foe of the big ship; the latter has larger purposes than the sinking of the submarine. It does not waste its powers on such small game — it cannot reach the snake, and scorns it while tigers are abroad. All the dreadnought can do is to run, then go about its business. Since the diver is slow under water, the big ship can escape if it scents danger.

Do submarines fight other submarines? In general not—just as airships do not, primarily, fight other

airships. Such craft, also, are hunting larger game. But underwater death grapples do occur: three times in the Adriatic, Italian submarines have been sunk by Austrian, or *vice versa.*

In the present war the submarine has done great things. The first German success was the sinking of the light cruiser Pathfinder in the Firth of Forth on September 5, 1914. Her destruction was very complete, only small wreckage remaining when fishing craft reached the spot. Then the famous U-9 bagged the three British 12,000-ton cruisers, Aboukir, Cressy, and Hogue, and a few days later sank the cruiser Hawke. Then the cruiser Hermes, the gunboat Niger, the battleship Formidable, the destroyer Recruit, the auxiliary cruiser Bayard—each stopped a torpedo and sank with great loss of life. Up to May the losses on British ships sunk by submarines had been over 2800, officers and men. Later, in the Dardanelles, the battleships Majestic, Triumph, and Goliath, met their fate. The British submarine E-9 sank the German cruiser Hela almost under the guns of Helgoland; and on December 11, 1914, B-11, *passing under five rows of mines* in the Dardanelles, sank the Turkish battleship Messoudieh, and won the V. C. for her captain. Other warships, including large cruisers and several transports, have paid tribute to the deadly submarine.

However, it cannot be asserted that the submarine has in any sense stopped hostile commerce or the transportation of troops. Only a small percentage of merchant ships have suffered, and the Allies have

Released by International News Service

THE GERMAN SUBMARINE U-36—LATE TYPE

thrown troops across the Channel and brought them from outlying colonies, with great freedom. Moreover, it is persistently reported by the press that the number of sunk or captured submarines is very large (from 50 to 70), that nets, into which submarines blindly steam, have been stretched across parts of the Channel, and that trawlers, fitted with large drag nets, bring them up like fish. Mines are fatal, as are bombs exploding on or near the submarine. It was officially announced that a diver had been sunk by an airship bomb. The most dangerous foes have been steam trawlers, fast motor boats mounting guns, and destroyers — particularly the latter, which have found a new calling.

Very fast motor boats, mounting one or more 3-inch guns, swarm over the war zone, and are expert against submarines.

"It is the habit, the reports say, of German submarines to slip into favorable position along the steamer lanes and lie on the bottom for long periods, rising occasionally to the surface. . . . The comparatively shallow water . . . makes it possible for the aeroplane operators to see the ships lying on the bottom. The aeroplane notes the position and notifies the nearest destroyer or patrol boat, which speeds to the spot and waits for the submarine to rise."[1]

Now as to the general characteristics of the submarine: Until recently we were accustomed to small, unobtrusive divers of several hundred tons. The latest type of German diver is a ship of 1000, probably 1200, tons, capable of steaming 5000 miles with-

[1] "New York Times, October 2, 1915, pp. 1 and 3. The effective use of a telephonic detector, capable of picking up a submarine's music 50 miles away, is also referred to.

out sighting a fuel ship—good, for instance, to run from Wilhelmshaven on the North Sea to Constantinople, sinking a battleship or two on the way. There is a late tendency to higher speeds—18 knots or more on the surface. The French have planned for 20 knots, and the Germans have probably attained it. Until recently 12 knots on the surface and 8 below were considered good. The figures 20 and 12 (respectively) are more nearly the maxima at present. For our own Holland boats see page 30. They use either gasoline or Diesel engines on the surface and *electric motors* below. The Lake "even keel" boats have a peculiar power of running along on the bottom; one building at Bridgeport has, it is claimed, a radius of 6000 miles.

The cost of a submarine is in proportion to its size—say from $300,000 to $900,000.

DETAILS AND OPERATION.—The coast defense diver is a cigar-shaped, low-lying whaleback, with a removable navigating bridge, a disappearing gun, a mast, a conning (or steering) tower, and a periscope (see next page). Wishing to dive, the captain has the bridge taken down, the gun lowered, the mast hinged down, and the hatches tightly clamped. The conning tower still projects, and the periscope above that. Water is then admitted to large tanks, so that the diver sinks until just awash, with the conning tower and periscope still in air. The motive power is now electrical.

Then the rudder comes into play. We all know

the ordinary ship's rudder for changing its course: submarines have also a *horizontal* rudder (sometimes both forward and aft) for pointing them up or down. "Down rudder" on a moving submarine will make the water press the stern up and the bow down. The boat will then gradually slip under.

The captain now steers by the periscope. This is a tube—a kind of telescope—projecting from two to five feet above the surface. It has a hood at the top, with an object glass, reflecting mirror, and prism; a magnifying glass; and another mirror and prism, with an eye-piece at the bottom. A ray of light (or the image of a ship) enters the object glass through the hood (which may be turned in any direction), and is deflected down the 5-inch tube by the prism and mirror; it passes through the magnifying lens; and at the bottom is again deflected out, by mirror and prism, through an eye-piece looking into the bottom of the tube. A man at this end sees objects a mile or two distant in the field of the object glass, and can direct ship or torpedo towards the victim. His own projecting periscope makes a very small target, but leaves a noticeable wake.

If the submarine sinks more, drawing the periscope under, the captain is blind and must steer by a compass; but, even if the enemy is near, he can "porpoise" occasionally for a quick look. Various schemes have been tried to conceal the periscope—for instance, letting it project through what seems to be a drifting box, or using dummy periscopes to mystify the prey. Submarines sometimes conceal

themselves behind one merchant vessel while another is coming within range. On the other hand, it has been proposed to spill oil on the surface to becloud the object glass of an enemy submarine.

Inside, the fish boat is a blaze of electric light and metal. Below the surface, air for breathing is supplied by tanks of compressed air. This air is also used for blowing out the water tanks in rising, and for discharging the torpedo.

Torpedoes are the fangs of the submarine; but only a few can be carried, and divers are beginning to use another weapon—the gun. The Krupps supply two submarine guns, one with a 2.95-inch, the other a 1.456-inch bore. The first, weighing some 1900 pounds, is in a sort of well, which is not watertight; when a bolt is removed, the gun bounces up into firing position by the action of a spring. It can be raised or lowered in twenty seconds. Rusting is prevented by a large proportion of nickel in the steel. There is also a larger gun below, but this requires time for mounting. Submarines frequently shell merchant ships instead of torpedoing them; one recently bombarded three English towns.

"Submarine is sighted!"—what shall we do? With speed, we can escape by steering zig zag courses, provided we are forewarned. But submarines are getting faster; and they can hit fast ships if, lying in wait, they fire from the bow or beam of the quarry. The Lusitania was making about 18 knots when *her* torpedo arrived. Destroyers afford excellent convoy. The question of underwater protection is

looming up—underwater armor, inner steel bulkheads, and other devices have been proposed. Torpedo nets are useless under way, and are of doubtful efficiency at anchor. Aeroplanes are important in this connection, since their observers can detect submarines otherwise invisible, and can also sink them with well-aimed bombs.

What about our submarines? Are we a power in the mermaid kingdom? Not yet a *Number One* power. Submarines have a peculiar value for us, with our brave but tiny army, and our first line of dreadnoughts outnumbered by possible enemies: yet the figures are as follows (the Secretary of the Navy's estimate, July, 1914):

England	84	submarines built *or building*
France	76	
Germany	31	
United States	51	

While we then had more submarines than one of these powers (Germany), she has undoubtedly surpassed us in the size, speed, and development of the type. She already has submarines of 1000-1200 tons; our largest in commission (September, 1915) are much smaller. Our L class, of 740 tons,[1] are not yet in service. The M-1, just launched, will displace about 1000 tons; and the sea-going submarine Schley will be larger. A recent great uplift in our submarine service is reported; exceptionally able officers are in

[1] These figures and the next are quoted from the "Army and Navy Register."

charge; and a school for the personnel has been established. But the fact remains that some of our divers have been unsatisfactory; and that the good ones are outnumbered or outclassed abroad. *Security demands more submarines* and more of the "sea-going" type—of which, at present, we have only one—on paper! Press reports state that our M-1, with four tubes and a 3-inch gun, will have a cruising radius of 2500 miles, which, in this day of grace seems insufficient.

And what of the future? The indications are that a sort of Burbank warship, half submarine and half destroyer, will be developed. We almost have that now; though the destroyer's 25 knots, and upwards, have not yet been attained. Judging from recent jumps to 18 and 20 knots, the day of destroyer-submarines is near. They whisper that we may also live to see submersible battleships!

A SUBMARINE AWASH

CHAPTER V

OTHER CLASSES—INCLUDING THE TRAIN

SOME years ago—indeed, a year ago—the torpedo boat and the destroyer would have deserved a separate chapter. Even now they are of undoubted importance; but events of the present war, emphasizing the value of that special torpedo-carrier, the submarine, seem to lessen the importance of above-water types. A *decade* back, during the Russo-Japanese war, the destroyer was in the lime-light. We all remember the dramatic raid at Port Arthur that opened the war, and the night attack with destroyers in Togo's greatest battle. But so far, during the present war, though some destroyers have been lost, there have been no startling torpedo-boat attacks, and no opportunity to use destroyers in pitched battle. Two were lost by the Germans off Helgoland, and four in a battle with the light cruiser Undaunted and four British destroyers. Their chief activity seems to have been against their under-water cousins. Their future seems to merge in that of the submarine.

As indicated, there are two great uses to which the destroyer may be put: the making of "torpedo attacks," night surprise attacks upon fleets at anchor in unmined or unprotected harbors or off a blockaded fort; and a tactical use in battle for day or night attacks upon battleships under fire. The destroyer is no

longer a night-prowler only; it is now recognized that during the confusion of battle, groups of these deadly, though tender, craft may reach the enemy's vitals.

In attacking, destroyers scatter and dash within range from different directions. Ships under way, expecting night attacks, run with lights screened, and keep their crews at the searchlights and the torpedo-defense guns. The greatest alertness is necessary, for destroyers must be seen and shot to pieces before they can launch their fatal missiles. On the ocean, at night, it is anything but easy to see a grey-green torpedo boat stealing up in the darkness, and still more difficult to pick up and destroy a dozen of these assassins attacking simultaneously from all sides. In port, ships keep their nets down, and are also protected by picket boats, mines, and other defenses.

What are torpedo nets? These are steel nets rigged out by booms from the sides of a ship. Underway they are of little use, and retard speed. At anchor they stop an old-style torpedo and cause it to explode against the *net* instead of the side. Some say that a percentage of fast, modern torpedoes, will cut through a net before exploding, since they have cutters devised for the purpose. European navies use them; we have been flirting with them of late. It is said that the battleship Triumph, which was sunk by a torpedo in the Dardanelles, had all her nets down.

In the present war the destroyer has found a new job. It has proved very useful as a submarine de-

stroyer, for with its high speed and handiness it can ram or shoot and escape the torpedo. The periscope betrays the diver to a nimble foe.

Modern destroyers are very fast, making from 29 to 36 knots, a maximum for war craft. They may have as many as twelve tubes (four triple tubes), in addition to a battery of 6-pounders and of smaller anti-aircraft guns. A late type carry three to four 4-inch guns.

A clever ruse in night surprises is for one destroyer flotilla to attack and throw the enemy fleet into confusion—then, when the banging of guns has ceased, the gunners have relaxed, and the lookouts are swapping yarns, for a *second flotilla* to descend in the darkness and finish the evening's work.

The United States has 38 destroyers in full commission, 17 in reserve and two out of commission—57 in all. But in August, 1914, Great Britain had 167 destroyers, Germany 130, France 84. We are outnumbered. The Germans, in particular have given much attention to their destroyer and torpedo service. Our latest destroyers have a displacement of about 1000 tons, and a speed of about 30 knots. The British Navy has a large number of big, fast "ocean-going" destroyers, has several "destroyer leaders," and has taken over four building for Chile. These displace 1850 tons, make 31 knots, and carry six 4-inch guns.

The cost of a large modern destroyer is (approximately) a million dollars.

Two types of ships have specially to do with

mines—the Mine Layer and the Trawler. One lays traps for the enemy, the other sweeps for the mines he has laid. We have a lonely mine-layer, the San Francisco, which is also a depot ship for mines. We have no trawlers on the navy list, but in time of war would use fishing craft to drag for the devil fish of steel and wire. Every day we hear of some trawler sunk by a submarine in the North Sea.

We now come to those non-combatant ships of the Train, that, in various ways, help the heavy fighters. Though some have been mentioned elsewhere, a complete list may be useful.

Auxiliaries and Special Types

AUXILIARIES

Transports	Hangar Ships
Fuel Ships	Despatch Vessels
Supply Ships	Tenders
Hospital Ships	Trawlers
Repair Ships	Mine Layers
Ammunition Ships	Tugs

Converted Yachts

SPECIAL TYPES

Prison Ships	School Ships
Station Ships	Training Ships
Receiving Ships	Naval Militia Ships

Most of these names are familiar; some require a word of explanation.

TRANSPORTS are used, of course, for transporting troops or sailors. At present those for troops are owned and handled by our War Department. They

are usually very weak in guns (if armed at all), and require convoy or protection. It is an axiom that troops cannot be transported safely without full command of the sea. A single enemy cruiser may be a grave menace. Armed and armored transports have been proposed.

FUEL SHIPS include colliers, oil ships, and gasoline ships. They are absolutely necessary for expeditions overseas, either to accompany the fleet, or to supply coal to advanced bases. It is very difficult to coal at sea (though appliances for this have been tried with promising results), and smooth water must be found. With oilers the problem is simpler. We now have a few fine colliers built for naval use, some converted merchant colliers, one oil tanker finished and two others building or authorized, and various mother ships or tenders carrying gasoline for submarines.

SUPPLY SHIPS carry refrigerated meat and other supplies for the fleet. At present we have only three (the Celtic, the Culgoa and the Glacier), all converted from the merchant service.

As to HOSPITAL SHIPS, our state is still worse. We have one (the Solace) in commission and another, which was shattered by a typhoon, dragging out its last years in the Philippines.

HANGAR SHIPS, as the name implies, are mother ships for aeroplanes and seaplanes, with hangars for

housing them. Though we have none, foreign nations are meeting this latter-day need.

All of the types named are in use during the great war. If this country adopts a policy of naval preparedness, it will be necessary to add extensively to our meager supply of auxiliaries. Since a navy, like an army, "travels on its belly," dreadnoughts and 15-inch guns are useless without projectiles. Submarines, like sailors, must be fed.

CHAPTER VI

GUNS AND AMMUNITION

THE Great War will end, but the treaty will not bring peace between guns and armor. As guns have grown bigger, armor has grown thicker, until warships, ever larger, are staggering under the load. In construction circles armament and protection have their keen advocates—and another factor enters: greater *speed* is constantly called for, and demands its share of allowable weights. Battleship building is a compromise. In other words—and many do not understand—with a ship of a given tonnage any increase in gun weight means a decrease in armor or in engines. The omission of a twin 15-inch turret will add a knot and a half in speed. Before scornfully asking: "Why do foreign dreadnoughts make 23 or 25 knots while ours make 21?" the citizen-proprietor must look to see if our dreadnought carries more guns.

The drift of opinion seems to be towards guns and engines with less armor. If a ship can shoot further and, with speed, can choose the range, it does not bother about protection—since the best protection, as Farragut said, is a heavy fire from our own guns.

In the matter of size the tide seems to be receding —the drift is towards smaller ships, avoiding too many eggs in a basket that may be crushed by one submarine. Notwithstanding their guns and speed,

the newest British ships are smaller than ours, and their latest will, it is said, be smaller still.

As to armor, a rule of thumb seems to be: "armor as thick as the calibre of the largest guns." For instance, the California will have 14-inch guns and 14 inches of side armor.

GUNS

"The object of a navy is to shoot guns." Only in the last decades have we realized how important it is to shoot for hits. Whatever the defects of size in our navy, we have certainly learned to shoot straighter than of old: Emerson, in his "Twelve Principles of Efficiency"[1] states that an American battleship is 3000 times as efficient as at Santiago in '98! Unluckily, foreign navies have made as great, perhaps greater progress, at the same time—and *comparative* efficiency is what counts.

How far can a big gun shoot? We have heard much of the "monster" German gun that, at exact intervals, drops a shell into Dunkirk, twenty miles away. That gun, it seems, is only a 12-inch naval rifle mounted for high angle fire. How far the 16.5-inch (42-centimetre) siege guns *could* carry remains to be seen. Most gun mountings do not permit of sufficient elevation for maximum ranges. That is the trouble, just now, with our coast defense guns; they have range, but lack elevation sufficient to meet the fire of Queen Elizabeths from seaward. The effective range for the largest naval guns is put at 10

[1] Page 81.

or 12 miles. In the battle cruiser action in the North Sea, fire was opened at 18,000 yards (over 10 land miles), and hits made at 17,000 yards. At greater ranges it is difficult to hit a small battleship, the earth being slightly in the way.

What are the largest naval guns? The British Queen Elizabeths carry the largest guns afloat, and the Germans are following suit on their battleships Ersatz Worth and T. In both cases the battery is eight 15-inch guns. Until this year German dreadnoughts have carried guns too light to be in style. When other nations put on 12-inch guns, they held to the 11-inch; when others changed to 14-inch, they moved up to 12-inch only—relying, apparently on the fine ballistic qualities of their Krupp ordnance. The latest French dreadnoughts (Jean Bart class) have twelve 13.4-inch guns. *Our* largest battery at present is ten 14-inch; when the Pennsylvanias are ready they will have twelve of these: of 15-inch weapons we have none afloat or promised. There was talk of a *16-inch* battery for the California, but a larger number of 14-inch guns was preferred. It may be noted in this connection that the Queen Elizabeth class are very speedy, making 25 knots against the 21 of our (future) Pennsylvanias. Most of our battleships have 12-inch guns. The Osman I, built in England for Turkey (but not delivered!) has fourteen of these—a maximum number for big guns.

These king cannon are installed in *turrets*, the number of which varies from one (on some monitors) to seven. The first turret had one gun; then for a

number of years two-gun turrets (one forward, one aft) were the rule. Now there are three-gun turrets (our Oklahoma and Nevada have two) and even four-gun turrets (as on the French Normandie class). Four seems to be the limit for guns *per* turret—and seven for the number of turrets. Four guns fired at once will jar the stoutest gunner.

In the matter of arrangement, we were the first to hit upon the proper rule, which we have followed, while others were floundering: *all turrets on the median line*. After losing part of their broadside fire by mounting guns where they were masked, foreigners have come to our method.

Battleships also have a secondary battery for torpedo defense—usually of 5-inch (about) or 6-inch guns. Our latest ships have twenty-two 5-inch; the latest foreign ships carry 6-inch. There is a hint that future tactics may put the secondary battery on a second ship.

"All big-gun ships" now carry a *third* calibre, in numbers not to be despised. The latest German dreadnought is said to have "many" 3.4-inch guns, doubtless for aerial defense. All future battleships will mount 3-inch, 4-inch, or larger, guns for this purpose; death will hover over the dreadnought that cannot ward off aircraft.

As to other types of warship: the battle cruiser carries big guns, but they are smaller or fewer than a dreadnought's. The latest British battleship has (as aforesaid) the 15-inch; the Queen Mary, latest battle cruiser, still carries the 13.5-inch. Armored cruis-

ers have decidedly light batteries, not more than 10-inch, usually less. The light armored cruiser, of growing importance (like the Arethusa of Helgoland fame) have 6-inch and 4-inch batteries. The latest destroyers mount 4-inch guns, and the latest submarines can doubtless match them. Even aeroplanes carry 1-pounders or machine guns.

AMMUNITION

Ammunition falls into three large classes—high-explosive and armor-piercing shell for ships; shrapnel for men. All are hollow, with bursting charges inside; but the walls of armor-piercing shell are very thick; those of shrapnel very thin. The first cannot pierce heavy armor at extreme battle ranges. Bursting charges are exploded at the proper time by the fuses described below.

What is shrapnel? Shrapnel consists of steel "cans" (compare the term cannister) filled with balls having a powder charge at the base. After so many seconds the powder explodes and scatters the balls, which rush further forward, and down, in a cone-shaped mass—and destroy men in batches.

A 12-inch shell weighs 870 pounds; a 14-inch shell, costing $700, weighs 1400 pounds; a 15-inch shell, about 1950 pounds. The thumb rule for weights is: *cube the calibre and divide by two.* In old days the weight of powder was one-half the shell weight: but the smokeless variety is stronger. The charge for the 12-inch is about 340 pounds; for the 14-inch, 365 pounds and upwards. The former will

penetrate 22 inches of armor at the muzzle, and half as much at 9000 yards. Heavy armor is not needed at extreme battle ranges.

Each shot of a German 42-centimetre howitzer is said to cost some $9000.

Before the reader wearies of statistics he may note that it takes "ten 14-inch shells" or one torpedo to sink a battleship, and that the expenditure in these cases is the same.

Special projectiles are used against aircraft. One is a combination shrapnel and shell, with a mass of smoky material tracing the latter's progress. When the shrapnel explodes, the bullets come out as usual, but the head (the shell in this case) goes further, and explodes on impact with anything heavier than a feather—say the canvas of a dirigible. Both explosions jeopardize the airman.

Another special type is the searchlight shell for lighting up sections of air of battlefield. Like Japanese fireworks, it scatters glowing "candles" in all directions.

FUSES.—These are of two general kinds—time and percussion. A time fuse has a train of powder, fired when the gun goes off, that can be set or cut to burn a fixed number of seconds. Then a little magazine is reached, the powder in it explodes, and the bursting charge is ignited. Clock-work fuses have also been devised.

The percussion fuse has a firing pin that is driven against the cap when the shell strikes. The result, of

course, is to fire the bursting charge. Fuses have a safety device to prevent premature explosions in handling. The pin of the percussion type is not in position for exploding the cap until the concussion of firing has forced a plunger down. If the shell merely drops, nothing happens.

Aircraft drop bombs weighing from 20 to 2000 pounds. Those dropped on London in a late raid weighed, it is said, almost half a ton. The fuse is "set," or armed for firing, by the turning of a vane as the bomb falls.

CHAPTER VII

TORPEDOES AND MINES

I. TORPEDOES

THE automobile torpedo is one of the most delicate and intricate bits of mechanism used at sea. Before each run it requires many adjustments; and after all have been made with expert care, it is as capricious as a lady's watch. Others after Farragut have "damned the torpedoes."

Three kinds of ship use them: submarines, torpedo craft, and capital ships. Submarines, fighting at short range, use a weapon with short range and greater available space for explosive. Other ships want all the range possible. The present maximum is about 10,000 yards (nearly six miles), with a speed of some 40 knots. This refers to the 21-inch torpedo, 21 feet long.

What are "capital ships?" These are ships capable of fighting in the first line, usually battleships or battle cruisers. They always have submerged torpedo tubes (usually four) for use when opportunity offers. In the battle off Coronel, Chile, Von Spee opened out (after closing in) for fear the British cruisers might use their torpedoes.

In general terms, the torpedo[1] (which costs about $7000) is a cigar-shaped, self-propelling, self-steer-

[1] For a clear and full description of the torpedo see "The Modern Automobile Torpedo," by E. F. Chandler, M. E., in the Scientific American for August 7, 1915, p. 112, *et seq.*

ing machine, that is launched from a tube and delivers a load of gun cotton—up to 250 or 300 pounds —against the underwater body of an enemy. It is *pushed* from the tube by compressed air, and proceeds under its own power. Its turbine engine is driven by compressed air stored in a flask. Thanks to the gyroscope (see below) it holds a steady course until near the end of its run; and by means of a pendulum and water piston (also described below) it holds its set depth of five to fifteen feet. It is the brainiest machine afloat.

The steel casing that contains air, explosive, and machinery is divided into various parts: the war-head, filled with gun cotton; the air flask; the immersion chamber, containing the constant-depth gear; the after body, containing the engine and other machinery; and the tail, with its rudders and propellers.

At the end of the war-head, corresponding to the fuse of a projectile, is the *war nose*. This is "armed" by the turning of a water vane during the first part of the run: then, whenever, the torpedo strikes, it detonates the explosive charge—which, being seven times that of a large armor-piercing shell, can shatter a ship and sink it.

The air flask contains air used for the engine and also for steering and for starting the gyroscope.

The hydrostatic piston is connected with the *horizontal* rudder in such a way that if the torpedo sinks too far and the water pressure gets too great, "up rudder" is given, and the torpedo starts upward (and *vice versa)*. But to avoid too much helm and too sud-

den changes, a pendulum is also connected up, so that with more than, say, three degrees inclination, it will move the rudder the other way and correct the excess.

In the after body is, besides the air-driven turbine engine, an alcohol flask for "superheating" the air. This corrects a tendency to freeze the works; for expanding air sucks heat from all around and leaves ice in its wake. An alcohol flame corrects this. An ingenious contrivance fires a cap and lights the alcohol when the torpedo is launched. This heating device has trebled or quadrupled the range of the torpedo, since it also makes the air do more work.

Another vital factor in torpedo efficiency is the gyroscope. But for this the torpedo would still, as of yore, curve round and hit the next ship in squadron or the ship that fired it. Through a tendency to remain in the same plane (however things under it may turn), the gyroscope, which is connected with the steering gear, constantly, like a chauffeur, brings the machine back to its course. Most late gyroscopes are started by compressed air; but an electric constant-impulse mechanism has been devised.

There are two rudders (vertical and horizontal), like the submarine's; and two propellers, which turn in opposite directions, to prevent a push to one side or the other.

The torpedo has many interesting mechanical details—enough to fill a book. Its operation is started by the automatic throwing of a lever in the act of launching.

The most striking late development in this field is a method of radio control that has reached the actual working stage. By this means, the gyroscope can be replaced by a human brain or ship or ashore, working with wireless waves. Captain Leon of the Swedish Navy has invented a fascinating method of *sound* control. Sound waves from the propeller of the target ship enter "ears" fitted to the torpedo. If this is headed straight for the target ship, the impulses through the two ears are the same and nothing happens; if it deflects, the impulses on one side become stronger, and, through a delicate mechanism, work a rudder that brings back the torpedo to its course. An American inventor talks of using *echo* waves (from a sound-making device) against a ship at anchor. In either case the ship is its own executioner.

II. MINES

Mines serve a double purpose. *Defensively*, they have been winning silent victories throughout the war; for, like "the fleet in being," they have protected certain harbors and channels as effectively as fighting dreadnoughts could. In 1898 Dewey braved the mines of Manila Bay; others pushed through fields in Guantanamo and other harbors: but since the Russo-Japanese War, mines have been treated with the high respect they deserve.

Offensively, they are used to blow up ships on the open sea, as explained on opposite page.

There are three kinds of mines—two anchored and one floating. Anchored *observation mines* have the

defensive use referred to above; they are fired electrically by an observer on shore. *Anchored contact* and *floating contact* mines are used in offense: the first to catch unlucky ships crossing shallow bodies of water like the North Sea, the other to damage pursuing squadrons or to force a maneuvering enemy into a desired course. The latter are dropped overboard by ships. One dropped by the fleeing German battle cruiser squadron after a raid sank the British destroyer D-5. The Germans used them in the battle off the Falkland Islands; but the pursuing British were too wary. Before an engagement these mines may be very useful to limit the enemy's movements; for he will hardly steer through a field of mines, even of *dummies*. There is always danger that the mine-laying ships may be "hoist by their own petard"; for mines, once dropped, do not discriminate.

What are contact mines? They are mines fired automatically when a ship strikes them. There are various firing devices—one a lever, which, when the mine spins round on impact, strikes the bow of the ship and pulls a trigger. Sometimes *two mines* are connected so that a ship passing between pulls both against its side.

In the Russo-Japanese War contact mines were deadly. The Russian flagship Petropavlovsk and the Japanese battleships Hatsume and Yashima met their fate through this agency. In the present struggle, warships have been remarkably lucky in the North Sea region (though not immune); but in the Dardanelles, the British battleships Irresistible and

Ocean and the French battleship Bouvet were sunk, with great loss of life, by floating mines.

A mine charge is about 500 pounds of gun cotton —twice that of a torpedo.

The British destroyer Lynx, and two cruisers, the Amphion and the Speedy, have been among the victims. When the Amphion fouled a mine (or two mines) her bridge was instantly enveloped in flames, and her captain fell unconscious. Before he could stop the ship, after coming to, all the forward part was a roaring furnace. The vessel had been badly shattered and quickly sank.

We cannot ignore the serious danger to neutrals (involving a grave infraction of their rights) through contact mines planted broadcast, or drifting across the lanes of ocean travel. Many neutral merchant ships have been sunk in this way. The same thing happened during the Russo-Japanese War, and the evil is a glaring one (see further reference to this in the chapter "Some Points in International Law"). After only two months of the present war, official records showed that five Danish, one Norwegian, and one Swedish ship had been sunk by mines scattered on the trade routes. Many innocent merchantmen and fishing vessels have come to this fearful end.

The menace from mines is met by *countermining* and *sweeping*.

In countermining, dynamite or other explosives are fired near the mines, thus causing a harmless, sympathetic explosion of their charges.

In sweeping, the ends of a chain cable or of a weighted hawser are secured to trawlers or destroyers working in pairs. These sweeps drag along the bottom, catch the anchored mines, and bring them to the surface, where they can be exploded by gun fire, if not already smoke. The British have organized a regular mine-sweeping service, and systematically clear the way for their shipping. This is dangerous duty, but very effective.

On the other hand, certain mine fields are protected by rapid fire batteries on shore. These make the vicinity unwholesome for boats or sweeping tugs.

Straying into the field of the future, we may note an undeveloped invention—the "magnet" mine—which, being electrically magnetized, will attract the steel hull of a passing ship. In this case, the armature moves the magnet: the ship, being less mobile, pulls the mine against its side in a suicidal hug.

CHAPTER VIII

SOME PRINCIPLES OF NAVAL WARFARE

WE KNOW that a naval commission implies knowledge of certain sciences—navigation, engineering, seamanship, astronomy. We also know that ships have target practice. But we are near forgetting that naval officers must master certain principles, military rather than mechanical, that underlie the *art of fighting*.

War has been defined as "diplomacy in another form." Behind our fighting lies our State Correspondence, underlying this our National Policies. These policies greatly affect our war plans.

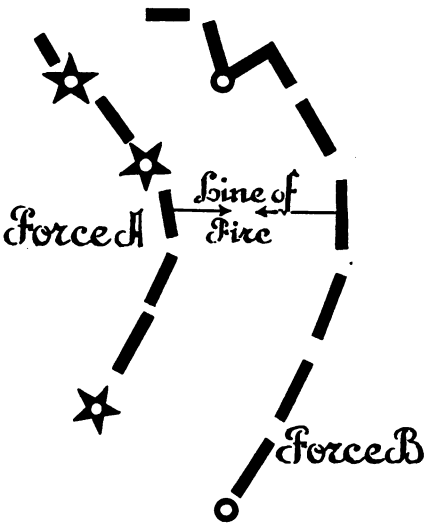
What are they? Chief among them have been: Defense, not Aggression; No Entangling Alliances; the Monroe Doctrine ("This is America—keep out!"); the Open Door in China; and, not least, the Protection of our Citizens. These are mentioned by way of illustration. Each country has its own set influencing profoundly the military principles and doctrine of that country.

The military art may be divided into two broad parts: Strategy, the art of getting ready to fight, of disposing forces *before contact with the enemy;* Tactics, the handling of forces in battle. Plans for establishing a blockade, or for intercepting a hostile expedition would fall under strategy; the choice of battle formation with the enemy in sight, under tactics.

Let us consider first some principles common to naval and army tactics. "The principles of strategy are immutable," but the *applications* on land, on sea, in air, must differ. Two of the most important military principles cover the value, (a) of the Central Position, (b) of Inside Lines.

What is the effect of Central Position? A central position between enemies is very advantageous in warfare. On land, during the present war, the geographical position of Germany and Austria between Russia in the east and France and England in the west, has given the Teutons certain unquestioned advantages. A country so situated can concentrate on either border at will, and can, without opposition, rush troops from side to side by the shortest line. As regards the North Sea and the Baltic, Germany is also central, with her Kiel (Kaiser Wilhelm) Canal permitting the movement of ships from sea to sea. Opinions differ as to the effect of the advantage; the *advantage* is unquestioned. The United States has a similar position with regard to any coalition formed against her by a European and an Oriental nation, but our connecting Panama Canal is not so safe from capture.

INSIDE LINES.—If forces operating against each other form lines in one case convex, in the other concave, to the line of operations, the former has a marked strategical (or tactical) advantage in being able quickly to reach any threatened part of the line from any other part—thus:



Force A, which is convex, has the benefit of inside lines; and can move reinforcements from one part of the line to another without crossing the line of fire, much more quickly than B can; just as it is much quicker to run straight from New York to Boston by rail than to round Nantucket and Cape Cod by the outside route. During the German drive on Paris, the allied center was less pushed back than the ends, hence their line was convex and they had the advantage of inside lines. Of course such an advantage may not be decisive.

Another important principle of strategy is to concentrate in mass against opposing forces, and to attack divided forces in turn. Strategy might be defined as the art of getting the stronger force in time

at the critical points. Tactics then give the *coup de grâce.*

It is interesting to note that strategic concentration involves "strategic deployment"; that is, in order to bring the greatest force against the proper point in the enemy's line, we must first spread our forces out in such a way that they may concentrate later against this point. It is like having a number of rifles in different corners all aiming at the same bull's-eye.

LINES OF COMMUNICATION.—Both at sea and on shore, lines of communication are vitally important. They are the lines by which a force keeps in touch with its source of supplies. To sever these lines is like "ringing" a tree—the sap cannot rise and the tree dies. If we sent an expedition against, say the Azores, and an enemy got between that force and our Atlantic Coast, so that colliers, supply ships, ammunition ships, would be captured in trying to reach the fleet, the expedition would surely fail and the ships would probably be sunk or captured. That is why, on shore, it is so important to "get astride" of railways. Logistics are vital.

What is the science of logistics? Logistics is the science of supplying fleets or armies. In any naval operation questions of supply must be studied "with prayer and fasting." Have we colliers enough? Can we keep the fleet supplied with ammunition? Are there convenient harbors where the ships can anchor and coal? Will the food supply be ample? In the gigantic operations abroad such questions have been

paramount. Some of the greatest efforts have failed for lack of adequate feeding arrangements for guns and men.

In naval warfare, the primary object of each side is command of the sea. Full command implies such dominance on the ocean that enemy ships are driven from the ocean, or are in constant fear of capture. Command is seldom complete. In the present war it appears that the Allies have had a *partial* command, disputed by the submarine. The commerce of their enemies has been practically stopped; their own has been somewhat hampered, but not stopped.

The advantages of command are: (1) Invasion is prevented, (2) the power to invade is secured, (3) friendly commerce is protected, hostile commerce is stopped. Experience has shown that troops can never be transported, landed, and supplied on enemy soil without this preponderance at sea. England has always avoided invasion, even by the world's conqueror, so long as her fleet was supreme. Nothing is more helpless than a convoy of troop-laden transports.

How is command obtained? To get command, the stronger force must destroy or bottle up the armed forces of the enemy. The first step, often difficult at sea, is to *find* the enemy—to solve a "search problem." Some admirals go hunting for him, as Sampson at first went for Cervera, with danger of missing him altogether; others wait where he will probably pass, as Togo waited for Rodjestvensky in the Sea of Japan. The next problem is to destroy him, or, if he has retired to his defended harbor,

either to keep him in, or to coax him out for a trouncing.

The weaker force disputes command; a "Fleet in Being," that is, a fleet still free to surprise enemy coasts or shipping, is a constant menace. So long as the weaker side has such a fleet, however small, command is not wholly lost. This side can also make raids and exercise command in restricted localities. Germany, for instance, has exercised command of the Baltic between Sweden and her own coasts.

Military blockade is important in strategy; its object is either to keep the enemy in or to force him to battle on venturing out, as Sampson forced Cervera at Santiago.

What is Commercial Blockade? Commercial blockade aims to stop enemy commerce. Warships lie off enemy ports and capture all (even neutral) merchantmen trying to enter or leave (see also under International Law).

It may be interesting to quote some of the maxims of naval strategy.

"The best defense is offense."

"Seek out and destroy the armed forces of the enemy."

"Our frontier should be the enemy's coast."

"The speed of a squadron is that of the slowest ship."

The fleet often co-operates with the army. The navy may help the army by convoying its transports and covering a landing; or the army may help the navy by seizing and holding advanced bases. His-

toric failures have resulted from lack of this co-operation.

What are advanced bases? These are harbors or islands in the war zone occupied, fortified and protected from submarine or other torpedo attack. The train can lie at such a base, or the fleet can run to it for rest or refuge.

In both strategy and tactics, the force of battleships plays the leading rôle; but in our own strategy, fast, powerful cruisers and submarines are very important. We should count on such cruisers to attack the colliers and transports of any enemy coming against us across seas, or to protect our own convoys. Speed ships are essential for these duties; and, with our big American island to guard, we know there would be work of this sort for cruisers.

The submarine is specially important for us; our policy of defense, not aggression, makes us chiefly interested in having our own waters malarious for an enemy. The mysterious diver gives him chills; one submarine off a harbor may make a fleet lie to. But we must always remember that "The best defense is offense," and that we must have dreadnoughts to thunder in mid-ocean.

As indicated above, another big element of our strategy is Scouting. We must find the invader, who will have a wide choice of routes, before he reaches our shores. In such case "scouting lines" are formed.

What are Scouting Lines? These consist of ships, perhaps forty miles apart, that go simultaneously to points in a line across a section of the sea, and, main-

taining their relative position, steam in line to sight the approaching foe. In order not to miss him in the dark they sometimes steam *away from him* at night, towards him by day. The scouting line keeps in touch with the fighting force (perhaps thousands of miles away) by a "wireless chain," and may be strengthened by a second supporting line of armored cruisers. In future scouting, aeroplanes or seaplanes, and perhaps airships, will be of great value, and will make the scouting line so long and impervious that no enemy will ever slip by. Until we have more scout cruisers and air craft, we shall always wonder whether he is striking at Maine or Texas, Oregon or Southern California.

Coming now to TACTICS—the art of handling ships for battle.

We begin by explaining some of the battle squadron formations.

What is Column? Ships are in column when they follow the leader, each ship in the wake of the next ahead.

What is Line? They are in line when steaming abreast.

What is Echelon (Line of Bearing)? These terms, applying to any formation intermediate between line and column, correspond to "right and left oblique" when troops are marching. The heading is the same for all ships, but the line through their foremasts is at an angle to the course. A "line of bearing" is the compass direction of this line.

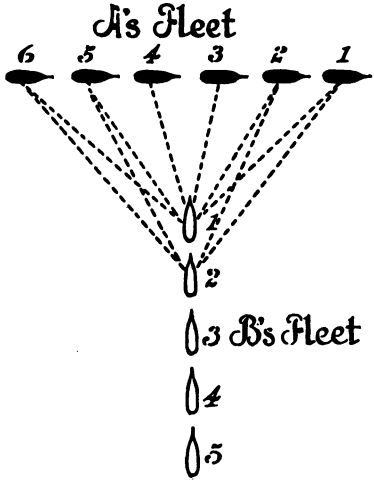
Line of Divisions is a compound formation, a line made up of divisions in each of which ships are in column. In Column of Divisions the ships of divisions are in line, the divisions in column.

In tactics there are standard ways of using these formations. To begin with, an admiral tries to gain an advantage in the *approach*. He wishes, if possible, to have the sun glare in the eyes of swearing enemy gunners; to have the spray cut *their* faces, salt *their* telescope lenses; to have the smoke from stacks and guns disturb their aim rather than his. He therefore studies weather and compass. He also keeps in mind the range of his guns as compared with the enemy's, and tries to approach in such a way that more of his guns than of theirs will land their iron.

At first blush this might seem to depend on how many guns each has, but tactics may reverse the count. If A has a few 12-inch guns and *speed*, while B has many 10-inch guns (with less range) and less speed, A can take position so far off that his few guns will be the only ones in action. This was about the situation in Perry's famous battle on Lake Erie, until he changed flagships and came to grips close in. Moreover, if the number of long-range guns is the same, a clever admiral can steal an advantage. Most ships fire more guns abeam than ahead; if one force engages in column, while the other is in line, the first gets beam, the second bow fire, and the first is a long way towards winning, especially as its opponent would suffer heavily in charging formation under fire. *Column* is thus the standard battle formation.

Aside from this, Admiral A can maneuver so that each of his ships can reach some enemy ship, while part of B's dreadnoughts can hit nothing but blue water. There are two good ways of doing this, one by the Cap or Tee, the other by the Elbow.

What is Capping or Teeing? If A can throw his column across the head (or stern) of B's column, he has *capped* it, and can concentrate his whole fire on B's leading (or rear) ships, while only those end ships can reach any of his own fleet, thus:

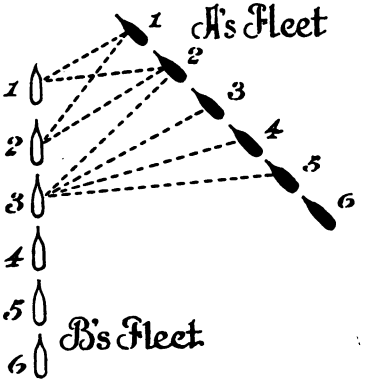


If the distance from A-1 and A-6 to B-2 represents extreme gun range, all of A's ships can concentrate on B-1 and B-2, which are the only ships that can return the fire.

Dotted lines represent lines of fire.

In the battle of the Sea of Japan, the Japanese opened the fight by capping the Russians at long range.

What is the Elbow? A formation like this (see diagram next page) helps A in a similar way.



In this case (as shown by the dotted lines) five of A's ships can reach the leaders of B's line, but only three of B's ships can reach any part of A's line.

In general, if A can keep his ships at right angles to the line from the center of B's fleet, he will have a maximum advantage in gunfire.

Tactical effect of Turning.—A large change of course during battle is bad; during several precious minutes the fire of the turning ship is inaccurate.

Use of Torpedoes in Battle.—In a fleet engagement, after A has "pumped B full of lead," he sends in his destroyers to attack with torpedoes. He must not do this too soon, for the little "tin-clads" are easily smashed; he must wait until the big ships are busy with other foes and (he hopes) demoralized. Then a lucky torpedo gives the knock-out blow. The submarine may also dash in, and offering only a small periscope target, may chance a shot earlier in the game. Heavy cruisers and battleships have torpedoes for occasional use. In launching them it is important to get a position on the bow of the ships at-

tacked, for the ship is coming towards the torpedo, making the effective range much greater.

How are Mines used in Battle? Most people know something about anchored mines, used to defend straits and harbors, or, of late, whole patches of sea; but few understand the use of floating mines. These may be dropped by fleeing ships to destroy a pursuing enemy; or, during an approach, they may be dropped in such a way as to hamper the enemy's movements and force him to one side, perhaps into the path of submarines. Dummy mines may confuse him further. The last Hague convention passed a rule requiring floating mines to carry a device making them harmless in an hour (see under International Law).

In time of peace, one of the most important duties of the fleet is to practice war maneuvers. Even then the handling of big ships in squadron requires great quickness and skill. With ships steaming 500 yards or less apart and performing maneuvers like those of a battalion ashore, collisions are often narrowly averted. Not many years ago the British ship Victoria was sunk in this way. I recall some uncertain moments on the bridge of a ship in squadron (at 300 yards distance), when a fog suddenly shut down. It is easy to imagine the difficulties when signals have to be read through battle smoke, and maneuvers performed with "Jack Johnsons" tumbling aboard.

CHAPTER IX

SOME POINTS IN INTERNATIONAL LAW[1]

THE fluctuations of the stock market are nothing to those of International Law. Changing like cloud forms, it is as treacherous as quicksand. Its rules, which have varied from war to war, are greatly affected in the present struggle by new methods in warfare—for instance, by the activities of the submarine. The trouble is that we have had no international police court or police. The League to Enforce Peace, in which Mr. Taft is prominent, aims to establish some system of international law upheld by potential force. Yet, even now, there is a vague body of principles fairly well established, like the conventions of polite society.

Though lack of space prevents discussion, the writer will state some of the principles that, in his opinion, were generally accepted before the war. These are based in large part on ratified conventions of the Second Hague Conference, which, in a way, codified the law of nations. The reader can make his own application to current issues.

May a neutral country aid either belligerent? No: it is the duty of the *government*, or of the country as

[1] For a fuller statement of the principles touched on in this chapter, see, in particular, "Outlines of International Law," by Rear Admiral Charles H. Stockton, U. S. N. (retired), who is also the author of an interesting article covering many current points in the "World's Work," for April, 1915.

a whole, to be scrupulously impartial. It must *enforce* neutrality if either belligerent tries to evade it; but belligerents are legally bound to respect it. In certain well defined cases—but in these only—the government must prevent unneutral acts by its citizens —for instance, the fitting out of armed expeditions against a belligerent. Neutral territory must not be used as a base for hostile operations.

But may citizens of a neutral country aid a belligerent? Generally, yes—*at their own risk.* The government will not protect them if they get into trouble through unneutral acts. They may, taking chances, supply the citizens or government of a warring nation with supplies, including money or munitions; but contraband (see below) is liable to seizure by the other side. If either belligerent is oppressive and illegal in its treatment of neutral citizens, the government may interfere, as ours did in 1812.

What is contraband? International law recognizes three classes of goods: (1) those unmistakably intended for the military use of the enemy, such as projectiles or sword-knots; (2) those that may, or may not be so intended, such as copper; (3) those clearly for non-military use, such as dolls or feather dusters. The first are absolutely contraband; the second conditional contraband; the third are not contraband. Contraband destined for the enemy is liable to capture; conditional contraband is confiscated if the courts of a belligerent find it to be intended for the armed forces of the enemy. There is no standard classification; each belligerent makes his own. The

Declaration of London (see below) classified raw cotton as noncontraband; but the Allies have recently declared it absolute contraband.

In any case, enemy destination must be proved. A belligerent today would have no right to capture war munitions shipped by Denmark to Spain, unless it was *shown clearly* that the ultimate destination was the territory (or armed forces) of the other fighter.

Have belligerents a right to capture neutral merchantmen? Yes, in certain well established cases—for instance, if the merchantman resists search, is running the blockade, is performing unneutral service. Enemy merchantmen, though privately owned, are liable to capture in nearly all cases. The right to *capture* involves the right to visit and search. All merchantmen must stop and submit to search when halted (by a shot across the bow). The shot is like a sentry's "Who goes there?" The belligerent is entitled to know.

Should ships be sunk before the customary visit and search? It is the view of our government (based on all former usage) that this must not be done, unless the ship is resisting or attempting to escape. Before the ship is sunk provision must be made for the safety of passengers and crew—a measure of humanity. If she resists she may be sunk like any other fighting ship.

Is it legal to capture reservists on a neutral ship? The Declaration of London, not yet in effect, provides for this.

What are the laws of blockade? Among the most important are: (1) the blockade of a port to be binding must be effective—it must make ingress and egress dangerous. Otherwise there is no *legally* established blockade; (2) enemy or neutral ships running such a blockade may be captured. There are many other rules. During our Civil War we set up the doctrine of "continuous voyage." A ship was deemed to be violating the blockade if its first destination was a neutral port, but its ultimate destination, or that of its goods, unmistakably a hostile port. A ship bound for a Mexican port with Confederate uniforms aboard was considered guilty; for such a cargo made final enemy destination a moral certainty.

In this war a new question arises—may the coast of a belligerent, considered as a whole, be blockaded from a distance? Heretofore ports have been blockaded separately, as the North blockaded Southern ports during our war. Now the Allies have set up a virtual blockade of the whole German coast; the Germans have attempted a submarine blockade of the British Isles.

There is, of course, no legal right to blockade *neutral ports*. We did not assert the doctrine of "continuous voyage" unless belligerent destination, *via* the neutral, was clearly indicated. Mere suspicion is not sufficient.

Is it legal to cut off food supplies from an enemy nation? It has been customary in wars to adopt this form of coercion, seldom reaching the point of actual starvation, but creating a strong pressure for peace.

The Union starved out the Confederacy and sent Sherman through it besides.

May belligerent ships use a neutral flag for purposes of deception? Yes, in special cases. A wholesale use of its flag would be objected to by a neutral. It is never permissible to *begin battle* under false colors.

What is the law about mines? The Second Hague Conference (see page 69) agreed that anchored mines must become harmless if adrift, and that floating contact mines must become harmless in one hour. These rules have probably been ignored, at least in many cases. The result is a great and unfair menace to neutral commerce. Neutral ships have paid toll in this war; in (or after) the Russo-Japanese War the *Chinese* lost over six hundred vessels from drifting mines.

What is the three-mile limit? A country "owns" the sea for three miles from its shore. Belligerents may not fight within this zone; but they sometimes *do*—and apologize! In the War of 1812, the British warships Phoebe and Cherub attacked and sank our Essex within the territorial waters of Chile. A similar violation of neutrality has occurred in this war.

What is the "twenty-four-hour rule"? There are two twenty-four-hour rules: (1) a belligerent warship must not remain in a neutral harbor more than twenty-four hours except in certain specified cases; (2) it must not sail from a neutral port within twenty-four hours of the sailing of an enemy man-of-war or merchantman.

Is the transfer of a belligerent merchant ship to a neutral flag legal during war? Yes, if the transfer is *bona fide*, not merely to avoid capture. The burden of proof is on the merchantman.

May undefended towns be bombarded by naval forces? No: but there may be questions of fact as to whether a town is "defended." This rule applies to aerial bombardment.

These are some of the questions involving international law on the sea that people are asking today. The answers given, though too brief to be precise, are exactly those that would have been given before July 30, 1914.

THE FREEDOM OF THE SEA

Much has been written about the freedom of the sea. As a nation we demand it.

Under modern law no nation owns any part of the high seas beyond its marine league; nor may any nation, even in war time, interfere with legitimate commerce between one neutral and another. But the belligerent right to capture private property at sea (in the cases discussed above and in some others) is not questioned. A belligerent may also blockade *enemy* ports, in this sense modifying freedom of the sea.

To some extent, international law has been defined by various international conferences—one at Paris, one at Brussels, one at St. Petersburg, two at Geneva, two at the Hague, etc. The Second Hague Confer-

ence of 1907 was perhaps the most important, and did most towards unraveling the tangle of customs and conflicting rules. The Declaration of London, embodying the results of the latest (naval) conference, tended towards further classification, but has not yet become effective. After the struggle, a Diet of New York may codify a new body of war-tested naval laws.

CHAPTER X

SHIPS OF THE AIR

FEW of our citizens—soldiers, civilians, or militant suffragists—have realized the importance of air power. In the *New York Times* of September 19, 1915,[1] the president of the Aero Club of America is quoted as predicting that next year's war in Europe will be *largely an aerial war*. The number of aeroplanes now engaged is at least 5000, perhaps 10,000; and the employment of much larger flotillas is probable. Germany shows no sign of lessened activity in building and using Zeppelins.

Aircraft divide into two main classes (each being subdivided)—aeroplanes and dirigibles. The term *airship* refers only to dirigibles. These in turn are of three kinds: rigid, semi-rigid, and non-rigid. Of the rigid type, Zeppelins are the best known; but it is as bad to call every dirigible a Zeppelin as to call every flying machine an airship. The Germans are strong in rigids (which are cellular, and have a supporting frame work), the French in non-rigids (which have few interior divisions, and no frame work), the British in neither—though expert with aeroplanes. Of semi-rigids, which have a keel, the Italian Forlaninis are perhaps the best known.

Aeroplanes are classed as monoplanes and bi-

[1] Magazine Section, page 6.

planes; and as tractors or pushers—depending on the position of their propeller. A special class of aeroplane is the seaplane, or hydro-aeroplane, which has pontoons instead of wheels, for waterwork.

Just as Zeppelins are analagous to dreadnoughts, so aeroplanes are like torpedo boats. A class of specially large and heavily armed "destroyers," carrying a ton of explosives and making 95 miles an hour, is about ready to enter the war. England is also building "scout" aeroplanes making over 100 miles, with which to warn London of Zeppelin raids.

A typical Zeppelin is 550 feet in length, 61 feet in diameter, displaces 30 tons, has a volume of 800,000 cubic feet, and has a speed of 50-60 miles *per* hour, with a range of 2000-3000 miles (a larger and faster type of Zeppelin is being built). Such a ship is armed with rapid-fire or machine guns (including one overhead), has armored cars, and carries a crew of 20 or more men. In addition to its load of men and fuel, it carries bombs—the total weight depending on the distance to be covered and the amount of fuel needed. For a run to London, a German Zeppelin might have only two or three tons of reserve buoyancy, and would be limited to that weight of ammunition. Zeppelin bombs range in weight from 90 to 1000 pounds, but heavier projectiles (and more) will certainly be carried as aerostatics develop.

The naval uses of aircraft are many. Primarily, they will be of great use for reconnaissance and scouting. Co-operating admirably with scout cruisers, they can extend the field of vision 60-100 miles on each

side. From his 5000 feet up an aviator can detect ships nearly 100 miles distant. The aeroplane will also be useful for spotting—that is, for marking the fall of shots in naval engagements. Their use against submarines, already referred to, has been demonstrated by the sinking of a diver with a bomb. They also help submarines by guiding them to their prey. For detecting submarine mines, for dispatch work, and for harassing commerce (*vide* the case of the American ship Cushing hit by a bomb from an aeroplane) their possibilities are well established. Their full use will not appear until the big fleets grapple.

Two questions have been much fought over: (1) *Are aircraft efficient for bombarding?* (2) *Are Zeppelins a failure?*

Reliable testimony indicates that the bomb-dropping use of aircraft (both aeroplanes and dirigibles) is progressive. Single machine attacks are giving place to squadron operations in which as many as 48 machines have co-operated. The simultaneous rising and circling of a squadron of 25 aeroplanes, with a big machine in the lead, must be a truly impressive sight. Each machine carries projectiles (at least 4 or 5) weighing from 20 to 90 pounds—the giant Sikorsky slow-fliers (good to take 18 passengers), could drop over a ton of these bombs. Serious damage has been done by aeroplanes raiding submarine bases like Zeebruggee or airship depots like Düsseldorf—and by Zeppelins bombarding London. If the quantity of metal is small (compared to that delivered by land guns), incalculable damage can be done by bombs

searching out places (like the Bank of London) inaccessible to enemy gun-fire.

What would happen if a well-timed and well-aimed high-explosive bomb shattered the Panama locks or closed the Kiel Canal?

It is well to remember that attempts so far have been tentative and experimental; that airmanship is an infant art; that bomb-dropping devices and other instruments will improve; that Zeppelins will grow bigger; and that aircraft will be numbered in thousands and projectiles in millions. If our naval gunnery improved 3000 *per cent* in fourteen years, bomb-dropping may do the same—*and then what?*

Aircraft will fight ships and forts rather than their kind; but the tactical struggle between aeroplane and dirigible is interesting. Lieutenant Warneford showed that a lone aeroplane can destroy a Zeppelin below. But the Zeppelin has its battery of light guns, including the aerial gun mounted on the envelope, and is protected at times by a screen of aeroplanes. By day it is in danger from aerial guns and from aeroplanes, but the latter dare not attack among bursting shells. It is essentially a night prowler, and is hard to land, as the gunners of London know. Zeppelins appear over the city at great heights (as much as 10,000 feet), and though the improved air guns of today can carry that far, are very hard to pick up and very dangerous for aeroplanes, being well supplied with machine guns, and so high that the small craft must climb through a long danger zone to reach the necessary overhead position. The "destroyers"

referred to above are specially designed to overcome these difficulties; for they mount long-range guns firing *up* as well as down. But night work is always dangerous; various aviators have been killed in making night landings.

Is the United States an air-power? Only a minor one. There is a rainbow of promise; energetic efforts are making to improve our position: but *in January, 1915*, we had only 23 aeroplanes land or sea, while France and Germany each had approximately 1000! We had no dirigibles at all; but at last decided to build a small one. While France spent over seven millions on aeronautics in 1913, Germany and Russia five millions each, Great Britain three millions, we spent $125,000. Our 1914 appropriation (following the outbreak of war) jumped up to a million; but rival nations, already far ahead, are speeding up too, and are training fliers in the hard school of war.

In one way we are lucky. Though we had developed no aircraft factories for ourselves, the European war has developed them for us; and we are now in a position to use the plants established for our belligerent customers. Let us "take the goods the gods provide" us!

APPENDIX

Strength of Our Own and of Foreign Navies[1]

	Dreadnoughts	Other Battleships	Battle Cruisers	Destroyers	Submarines
United States.....	10 built 5 building	[22]	0	49 built [8 building]	45 built 8 building
Great Britain.....	28 built 8 building	39	6 built 3 building	223 built 15 building	76 built 20 building
Germany.....	17 built 2 building	20	4 built 3 building	144 built	30 built 9 building
France.....	13 built 5 building	16	0	82 built 9 building	79 built 13 building
Italy.....	4 built 3 building	11	0	36 built 10 building	18 built 2 building
Russia.....	0 built 7 building	9	3 building	104 built 45 building	33 built 2 building
Austria.....	4 built 0 building	9	0	18 built — building	6 built 8 building
Japan.....	4 built 2 building	12	1 built 3 building	56 built 2 building	13 built — building

[1] Figures compiled from Brassey's Naval Annual, 1915. In the main they represent conditions just prior to the war. Since 1914 no exact data is obtainable as to changes in foreign navies or as to casualties, but see text for record of many losses. The figures for the United States are later than those for foreign navies, and make relative strength somewhat too great.

INDEX

PAGE

Aboukir 24
Audacious 11
Aeroplanes 71-5
(See Aircraft)
Against Dirigibles 74
Classes of 71
Scout 72
Aircraft 71-5
And Submarines 26
Bombarding 73
Classes of 71
Naval Uses 72
Spotting 73
Air Power—
Importance 71
Of United States..... 75
Ammunition 42-4
(See also Shells and Projectiles)
Amphion 50
Approach 60
Armor 38-9
Auxiliaries 21, 35
Bases, Advanced 58
Battery—
Aerial 41
Secondary 41
Battleships 1, 7-15
(See Dreadnoughts)
How Distinguished..... 14
In Baltic 10, 11
In Strategy and Tactics..
.....58, 61-2
Submersible 31
Blockade 57, 67
Commercial 57
Distant 67
Laws of 67
Military 57
Neutral Ports 67
Blücher 18

PAGE

Bombardment—
Aerial 73
Unfortified Towns 69
Bombs 73
Bouvet 11
Brussels 69
Capital Ships 45
Capping 61
Capture—
Contraband 65
Neutral Merchantmen .. 66
Private Property 65
Submarines 26
Charges—
Bursting 42
Firing (Guns) 42
Mines 50
Torpedoes 46
Colliers 36
Column 59
Of Divisions 60
Command of Sea.....8, 56
Advantages of..... 56
How Obtained 56
In Past Wars..... 56
Co-operation—
Army and Navy..... 57
Communication, Lines of.. 55
Compressed Air—
Submarines 29
Torpedoes 46
Concentration, Strategical.54-5
Conferences 69
Contraband 65
Classes of 65
Conditional 65
Coronel 18
Cost—
Battleship 14
Destroyer 34
42-cm. Charge..... 43

PAGE

Cost (Continued):
Submarine 27
Torpedo 45
Courbet 11
Countermining 50
Cressy 24
Cruisers 3-5, 16-22
And Battleships 16
And Blockade 21
Armored 4, 18
Auxiliary 21
Battle 4, 17
Dreadnought, Function of 16
Light Armored 5, 18
Protected 5, 20
Scout 5, 20
Speed 4, 16
Dardanelles 2, 11
Declaration of London.... 70
Destroyers 5, 32-4
(See Torpedo Boat)
Against Submarine 26
Cost 34
Defense from 33
Displacement 34
Foreign 34
In Attack 33-4
In Russo-Japanese War . 32
Ocean Going 34
Off Helgoland 32
Our Strength 34
Ruse by 34
Sinking D-5 49
Speed of 34
Uses 32
Diplomacy and War..... 52
Dirigibles—
Classes of 71
Dreadnoughts 1, 7-15
(See Battleships)
Accomplishment this War 9
And Submarine 15, 24
Armor 13, 39
Characteristics 2, 12
Guns 12

PAGE

Dreadnoughts (Continued):
Not Obsolete 7
Protection from Submarines..... 15
Speed 13
Echelon 59
Elbow 61
Emerson 39
Factories, Aeroplane 75
Flag, False Use of..... 68
Flanders, Monitor off..... 3
Fleet in Being..... 57
Fluctuations of Law..... 64
Freedom of Sea..... 69
Fuel Ships 36
Fuses 43
Gasoline Ships 36
Gaulois 11
Geneva 69
Gyroscope 47
Guns 12, 38-42
And Armor 38
And Speed 38
Battle Cruiser 17
Battleship 12
Destroyer 42
Largest Naval 40
Range 39
Submarine 29
Hague, Second Conference 64, 68-9
Hangar Ships 36
Hatsume 49
Hogue 24
Hospital Ships 36
International Law 64-70
International Police 64
Internment 21
Irresistible 11
Lines 59
Inside 53
Of Communication 55
Of Divisions 60
Scouting 58
Logistics 55

PAGE

London, Declaration of 65, 66, 70
Majestic 11
Maneuvers 63
Maxims of Strategy..... 57
Michigan 2
Mines 48-51
  And Submarines..... 26
  Charge 50
  Classes of..... 48
  Danger to Neutrals...50, 68
  Dummy 49
  Effect of 50
  Firing of 49
  Magnet 51
  Protection of..... 51
Mine Layer 35
Nets—
  Anti-Submarine 26
  Torpedo 33
Net Cutters 33
Neutral—
  Citizens 65
  Government 64
  Merchantmen 66
Ocean 11
Oil Ships 36
Paris 69
Pendulum (Torpedo)..... 47
Perry 60
Periscope 28
  Concealment of 28
  Description 28
  Oil Against..... 29
Piston, Hydrostatic 46
Policies, National 52
Position, Central 53
Projectiles (see Shells)...42-3
  Guns 39
  Torpedo 45
Registry 69
Reservists, Capture of..... 66
Rudder, Horizontal.....28, 46
Scouts 5, 20
  And Airships..... 72

PAGE

Scouts (Continued):
  Cruiser 5, 20
  Function of 5, 20
  United States 20
Scouting 58
  Importance of 58
  By Aeroplanes 72
Sea, Freedom of..... 69
Seaplane 72
Shells 42-3
(See Projectile)
  Combination 43
  Searchlight 43
  Weight of 42
Shooting, Our Naval..... 39
Size of Ships..... 13
Sound Steering of Torpedo. 48
South Carolina 2
Starving of Nation..... 67
St. Petersburg 69
Strategy—
  Definitions 52
  Immutability 53
Submarines 6, 23-31
  Against Submarines 23
  And Aeroplanes 26
  And Commerce 24
  Characteristics 26
  Cost 27
  And Dreadnought 15, 24
  Destroyer 26
  Details 27
  Escape from 29
  Foes of..... 26
  Foreign 30
  Guns 29
  Holland 27
  In General 23
  Interior 29
  In this War..... 24
  Lake 27
  United States 30, 58
  Operation 27
Superheater (Torpedo) ... 47
Supply Ships 36

	PAGE
Sweeping	50
Tactics	52, 59
Teeing	61
Three-Mile Limit	68
Torpedo	45-48
Charge	46
Cost	45
Launching	46
Nets	33
Parts of	46
Ships Using	45
Sound Steered	48
Wireless	48
Torpedo Boat	6
(See also Destroyers)	
Train	6, 35
Transfer of Registry	69
Transport	35
Trawler	35
Triumph	11
Turrets	40
Twenty-four-hour Rule	68
Victoria	63
Visit and Search	66
Voyage, Continuous	67
Wireless Torpedo	48
Wireless Chain	20
Yashima	49
Zeppelins	71-5
And Aeroplanes	74
Night Use	74
Value of	73
Typical	72

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